

***COFFS HARBOUR CITY COUNCIL***



**DEVELOPMENT SPECIFICATION  
DESIGN**

***0292 Masonry walls***

***Version 1      01 January 2009***

<b>0292 MASONRY WALLS</b>
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## 1 SCOPE AND GENERAL

### 1.1 SCOPE

This worksection covers the laying of concrete, brick or stone masonry units and construction for retaining walls and free-standing walls such as noise attenuation, dwarf and feature walls for landscaping or similar structures.

The work to be executed under this worksection consists of excavation for foundations, construction of reinforced concrete footing, placement of masonry units, backfill and subsurface drainage to the wall as shown on the Drawings.

### 1.2 QUALITY

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are given in 0161 *Quality (Construction)*.

### 1.3 REFERENCED DOCUMENTS

The following documents referred to in this worksection shall be deemed as the latest edition of the Australian Standards, including amendments and supplements.

#### Worksections

0161 *Quality (Construction)*

0179 *General requirements (Construction)*

0310 *Minor concrete work*

1102 *Control of erosion and sedimentation*

1171 *Subsurface drainage*

1172 *Subsoil and foundation*

#### Standards

AS 1012 Methods of testing concrete

AS 1012.3.1 Determination of properties related to the consistency of concrete—Slump test

AS 1012.9 Determination of the compressive strength of concrete specimens

AS 1141 Methods for sampling and testing aggregates

AS 1141.11 Particle size distribution by dry sieving

AS 1289 Methods for testing soils for engineering purposes

AS 1289.5.4.1 Soil compaction and density tests—Compaction control test—Dry density ratio, moisture variation and moisture ratio

AS 2758 Aggregates and rock for engineering purposes

AS 2758.1 Concrete aggregates

AS 3700 Masonry structures

AS 3972 Portland and blended cements

AS/NZS 4455 Masonry units and segmental pavers

AS/NZS 4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles

#### Other publications

*Clay Brick and Pavers Institute*

Design Manual 3 – The full brick manual.

### 1.4 CONTROL OF EROSION AND SEDIMENTATION

The Contractor shall install and maintain effective erosion and sedimentation control measures during the construction of the masonry wall in accordance with 1102 *Control of erosion and sedimentation*.

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## 2 MATERIALS

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### 2.1 MASONRY

#### Specification

Masonry units shall comply with AS/NZS 4455 and shall be manufactured from either:

- autoclaved aerated concrete
- calcium silicate (sand-lime)
- concrete (dense or lightweight)
- dimension stone (cut or dressed)
- fired clay (with or without shale).

The masonry unit material, type and category shall be as shown on the Drawings.

For concrete masonry, irregular faced units shall be either split face, profiled, textured or rock-faced as shown on the Drawings or as directed by the Superintendent.

The colour of masonry units shall be as shown on the Drawings and shall be within the agreed range as approved by the Superintendent.

Dimension stone shall be of the type and quality, and to the dimensions as shown on the Drawings or as directed by the Superintendent.

#### Evidence of conformance

Masonry units shall not be placed in position until the Contractor has produced documentary evidence to the Superintendent that the units conform to the requirements of this worksection and AS/NZS 4455.

This action constitutes a HOLD POINT.

The Superintendent's approval of the documentary evidence is required prior to the release of the hold point.

### 2.2 CEMENT

The cement used shall be Type GP Portland cement complying with AS 3972.

### 2.3 SAND

The sand shall conform to AS 2758.1. It shall be clean, sharp and free from salts, vegetable matter and impurities.

### 2.4 MORTAR

The mortar shall consist of 1 part of Portland cement, 4 parts of sand and 0.005 parts of a water thickener approved by the Superintendent. Suitable pigments shall be used to match the colour of the adjacent units.

### 2.5 CONCRETE

Concrete supplied and placed for the reinforced concrete footing and 50 mm mass concrete blinding layer shall comply with 0310 *Minor concrete works*.

Unless otherwise indicated on the Drawings, the concrete shall have a compressive strength not less than 20 MPa when tested in accordance with AS 1012.9, with a maximum nominal size of aggregate of 20 mm and a nominated slump at the point of placement not exceeding 80 mm as determined by AS 1012.3.1.

### 2.6 STEEL REINFORCEMENT

#### Specification

Steel reinforcement provided for concrete shall comply with 0310 *Minor concrete works*.

#### Galvanising

In addition, where galvanising of reinforcing steel is indicated on the Drawings or otherwise specified, such galvanising shall be an average minimum coating thickness of 85 µm of not less than 98% by mass of zinc when tested in accordance with AS/NZS 4680.

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### 3 SITING AND EXCAVATION

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#### 3.1 SET OUT

The Contractor shall set out the masonry wall structure as shown on the Drawings in sufficient detail to identify the location, length and height of the wall.

#### 3.2 DESIGN CHANGES

Should the Contractor propose changes to location, length, height, design levels or strength, to suit the Contractor's purposes or construction techniques, the Contractor's proposals shall be presented for the Superintendent's approval.

Changes to suit the Contractor's construction procedures shall be at the Contractor's cost.

The Contractor shall present the masonry wall structure set out, including any changes proposed by the Contractor, for the Superintendent's approval prior to commencing excavation.

This action constitutes a HOLD POINT.

The Superintendent's approval of the set out is required prior to the release of the hold point.

#### 3.3 FOUNDATION LEVEL

The foundation level shall be defined as the level at the underside of the 50 mm mass concrete blinding layer below the reinforced concrete footing.

The levels and dimensions of foundations shall be recognised as subject to confirmation or alteration before construction, and the Superintendent may direct such changes of the levels and of dimensions of footings as may be necessary to ensure a satisfactory foundation.

#### 3.4 EXCAVATION

##### Specification

Excavation shall be undertaken to the required width, depths and dimensions of footings shown on the Drawings, including the 50 mm mass concrete blinding layer.

All loose material shall be removed. Minor fissures in rock shall be thoroughly cleaned out and filled with concrete, mortar or grout.

##### Compaction

The base of the excavation shall be compacted in accordance with the requirements of Clause 4.10 and trimmed to ensure that at no point the level is more than 25 mm above the design Foundation Level.

The levels of the base of the excavation shall be confirmed by survey.

##### Over-excavation

Any over-excavation in rock below foundation level shall be filled with concrete of the same quality as that of the footing, while over-excavation in earth below foundation level shall be backfilled and recompacted to the requirements of **Compaction**.

Surplus excavated material shall be used in the construction of embankments, or spoiled as directed by the Superintendent.

##### Safety

The Contractor shall supply and erect any necessary sheeting and bracing to support the excavation in a safe manner and in accordance with statutory requirements. The excavation shall be kept free of water.

##### Unsuitable foundation

Following excavation to Foundation Level, the Contractor shall present the foundation on which the footing for the wall is to be placed for inspection and approval by the Superintendent.

If the foundation is composed of material which the Superintendent deems to be unsuitable to support the proposed structure, such material shall be excavated to the extent directed by the Superintendent, backfilled with sound material, and recompacted to the requirements **Compaction**.

The foundation shall then be presented again for the approval of the Superintendent. The unsuitable material from the excavation below Foundation Level shall be spoiled as directed by the Superintendent.

This action constitutes a HOLD POINT.

The Superintendent's approval of the foundation is required prior to the release of the hold point.

## **4 CONSTRUCTION**

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### **4.1 REINFORCED CONCRETE FOOTING**

#### **In accordance with drawings**

The reinforced concrete footing shall be constructed to the details as shown on the Drawings.

#### **Formwork**

Unless otherwise indicated on the Drawings, forms shall be used for all vertical concrete surfaces.

All formwork shall comply with 0310 *Minor concrete works*.

#### **Placement and compaction**

For the reinforced concrete footing and 50 mm mass concrete blinding layer, the placement and compaction of concrete, including joints, finishing, curing and protection of concrete, and the placement of the reinforcing steel, including starter bars, shall comply with 0310 *Minor concrete works*.

#### **Tolerance**

The finished concrete footing shall not vary by more than 10 mm from the specified levels and by more than 25 mm from the specified horizontal alignment.

### **4.2 MASONRY**

#### **Standard**

All workmanship and site control in masonry construction shall be in accordance with AS 3700.

#### **First course**

The surface on which the first course is to be laid shall be clean. It shall be checked for vertical and horizontal alignment and any excessive discrepancy shall be corrected before masonry construction is commenced.

#### **Horizontal courses**

Masonry shall be placed in horizontal courses and to the details as shown on the Drawings.

#### **Weepholes**

Weepholes shall be provided in the wall as shown on the Drawings.

### **4.3 MORTAR JOINTS**

Bed joints and perpendicular joints shall be 10 mm thick. In hollow masonry units, mortar shall be face shell bedded and for structural work shall be ironed.

To control cracking, joint reinforcement, consisting of two 3.0 mm galvanised wires shall be incorporated at a maximum of 600 mm centres. All joints shall be ironed on both sides.

### **4.4 CONTROL MOVEMENT JOINTS**

#### **Location and detail**

Control movement joints shall be built into masonry where shown on the Drawings and at all points of potential cracking.

The joint spacing shall not be greater than 10 metres.

The joints shall be 12 mm wide and completely clean and free from any hard or incompressible material for the full width and depth of the joint.

#### **Joint filling**

After completion of the walls, a suitable backing rod shall be inserted on both sides of the joint and the joint filled with an elastic polyurethane joint sealant approved by the Superintendent.

Sealing of joints shall be carried out in accordance with the Sealant Manufacturer's instructions and recommendations.

The colour of the joint sealant shall be selected by the Superintendent from samples provided by the Contractor.

#### 4.5 REINFORCEMENT

Vertical steel reinforcement shall be tied to steel starter bars through cleanout holes in each reinforced hollow unit and fixed in position at the top of the wall by plastic clips.

Horizontal steel may be laid in contact with rebated webs. It shall be held in position by plastic clips when vertical steel is to be positioned subsequent to wall construction.

Cover to horizontal steel in lintel blocks shall be maintained by the use of wheel type plastic clips.

The minimum cover to the inside face of the block shall be 15 mm unless specified otherwise.

#### 4.6 CONCRETE GROUT

Concrete grout shall be a minimum Portland cement content of 300 kg/cubic metre, sufficient slump to permit it to completely fill the hollow units and a minimum compressive cylinder strength of 20 MPa when tested to AS 1012.9.

The Contractor shall ensure that the bottoms of hollows are cleaned of loose material before being filled with grout.

#### 4.7 RATE OF CONSTRUCTION

The rate of new construction shall be limited so as to eliminate any possibility of joint deformation, slumping or instability that may reduce bond strength in the wall.

#### 4.8 CLEANING OF MASONRY

Cleaning of masonry shall comply with the *CBPI Design Manual 3 – The full brick manual*.

Where the wall is constructed as a free standing wall, both sides of the wall shall be cleaned of all mortar splashes and stains.

Where acid cleaning is required, the following shall apply:

- The acid mixture shall be 1 part of hydrochloric acid to 15 parts of water.
- Mortar joints must be a minimum of 7 days old before cleaning commences.
- All masonry being cleaned shall be thoroughly wetted by hosing before any acid solution is applied and kept wet ahead of the acid application.
- The acid mixture shall be thoroughly hosed off as the cleaning proceeds.

If high pressure water jet method is used for cleaning, extreme care shall be taken to avoid 'blowing out' the joints.

#### 4.9 BACKFILLING FOR RETAINING WALLS

##### Cleanup before backfill

Where masonry walls are constructed as retaining walls, all timbering, bracing and rubbish of all descriptions shall be removed before backfill is placed.

##### Curing

No backfilling shall be placed against retaining walls until the Contractor can demonstrate that 95 per cent of the design strength of the masonry wall has been achieved.

This action constitutes a HOLD POINT.

The Superintendent's approval of the 95% design strength documentation is required prior to the release of the hold point.

##### Drainage layer

Behind the masonry wall, and for the full height of the wall, a continuous granular drainage layer of width as shown on the Drawings (measured perpendicular to the face of the wall) shall be progressively placed in layers not exceeding 150 mm and compacted in accordance with Clause 4.10.

It shall consist of broken stone or river gravel, consisting of clean, hard, durable particles graded from 50 mm to 10 mm to AS 1141.11 such that:

- The maximum particle dimension shall not exceed 50 mm;
- No more than 5 per cent by mass shall pass the 9.5 mm AS sieve.

##### Subsoil pipe

A subsoil drainage line shall be constructed at the base of the drainage layer as shown on the Drawings.

It shall outlet either into adjacent stormwater gully pits or headwalls, or alternatively through adjacent fill batter, and be suitably marked.

The subsoil drain shall comply with the requirements of 1171 *Subsurface drainage* and 1172 *Subsoil and foundation drains* and shall consist of 100 mm diameter slotted corrugated plastic pipe and seamless tubular filter fabric, surrounded by a maximum of 100 mm of Type A Filter Material contained within a layer of geotextile.

Unless shown otherwise on the Drawings, the subsoil pipe shall be laid to an even line and uniform grade of not less than two per cent fall towards the outlet.

#### **Other backfill material**

Except as specified above, excavations for foundations and for the construction of the masonry walls shall be backfilled to the level of the surrounding ground with material from cuttings, or with other material acceptable to the Superintendent, and compacted in accordance with **Compaction**.

#### **Sealing tops and ends of walls**

Complete sealing utilising compacted earth, or other treatment as shown on the Drawings, shall be provided at the top of masonry walls over the full length and at the vertical edge at both ends of all masonry walls to the satisfaction of the Superintendent.

#### **Other forms of sealing**

Where erosion is likely to occur the Superintendent may direct that backfilling around the ends of walls be of stone fill or lean mix concrete, in which case the extra work will be paid for as a Variation to the Works.

### **4.10 COMPACTION**

Foundations and backfill shall be compacted to the following requirements when tested in accordance with AS 1289.5.4.1 for standard compactive effort:

	Relative compaction
(a) Foundations or base of excavation to a depth of 150 mm below foundation levels	95%
(b) Granular drainage layer, subsoil filter material, material replacing unsuitable material and backfill material	95%

Unless otherwise directed by the Superintendent, all material shall be compacted in layers not exceeding 150 mm compacted thickness.

## **5 LIMITS AND TOLERANCES**

The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 5.1.

**Table 5.1 Summary of limits and tolerances**

<b>Activity</b>	<b>Limits/tolerances</b>	<b>Worksection clause reference</b>
<b>Excavation</b>		
-Foundation Level	Level of foundation for footing at any point shall not be more than 25 mm	<b>Excavation</b>
<b>Reinforced concrete footing</b>		
-Finished Level	Finished level of footing shall not vary more than 10 mm from the specified levels	<b>Reinforced concrete footing</b>
-Horizontal Alignment	Horizontal alignment of footing shall not vary more than 25 mm from the specified alignment	<b>Reinforced concrete footing</b>
<b>Masonry</b>		
-Control movement joint	Spacing $\leq 10$ m	<b>Control movement joints</b>

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## 6 MEASUREMENT AND PAYMENT

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### 6.1 MEASUREMENT

Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items 0292.1 to 0292.4 inclusive.

A lump sum price for any of these items shall not be accepted.

If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

Erosion and sedimentation control measures are measured and paid in accordance with 1102 *Control of erosion and sedimentation*.

Construction of footings, including concrete, reinforcement, formwork, etc, is measured and paid in this Specification and not 0310 *Minor concrete works*.

The granular drainage layer, subsoil drainage pipe and filter material is measured and paid in accordance with this Specification and not 1171 *Subsurface drainage* or 1172 *Subsoil and foundation drains*.

### 6.2 PAY ITEMS

#### 0292.1 Excavation

The unit of measurement shall be the cubic metre measured in bank volume of excavation.

The volume shall be determined by the End Area Method using design cross-sectional areas calculated at each change in height or width of the wall.

The disposal of surplus material shall be included in the excavation rates.

No additional payment shall be made for drying out wet excavated material or replacement of over excavation beyond the design cross-sectional limits defined above.

The schedule rate for excavation shall allow for excavation and backfilling of all types of materials. Separate rates shall not be included for earth and rock.

The control of stormwater runoff shall be included in the rate for excavation.

#### 0292.2 Unsuitable material below foundation

The unit of measurement shall be the cubic metre measured as bank volume of excavation below foundation level which is directed to be removed and replaced.

The schedule rate under this Pay Item shall include all operations involved in the excavation and removal to spoil of unsuitable material below foundation level of the concrete footing and the backfilling and compaction to foundation level with replacement material.

#### 0292.3 Reinforced concrete footing

The unit of measurement shall be the cubic metre of reinforced concrete.

The volume shall be taken from the Drawings, excluding the volume of the 50 mm mass concrete blinding layer.

The schedule rate under this Pay Item shall include all operations involved in the supply and placement of all formwork, embedments, reinforcement (including starter bars where specified), concrete (including 50 mm mass concrete blinding layer), stepping of footing, joints, curing and backfilling to the footing.

#### 0292.4 Construct masonry wall

The unit of measurement shall be the square metre, measured as face area of masonry wall from the top of the footing to the top of the wall.

The schedule rate under this Pay Item shall include all operations involved in the supply and placement of all materials and workmanship required to provide the completed structure as shown on the Drawings including supply, placement and cleaning of masonry units, and where specified granular drainage layer behind the wall, earth backfill and capping, and subsoil drain at the base of the drainage layer.